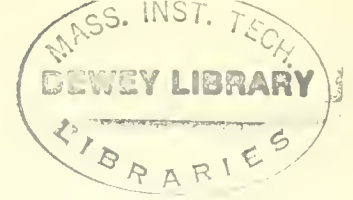


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INFORMATION TECHNOLOGY:

A STRATEGIC OPPORTUNITY

Robert I. Benjamin, Xerox Corporation

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December 1983

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Center for Information Systems Research

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Senior executives are being barraged by the business press with the message that personal computers, computer-aided design, telemarketing, and a myriad of other applications of electronic technology will give them and their companies new muscle tone and greater profits. Behind this ever increasing assault, there is the reality of an ever expanding gap between the opportunities that information technology present and the effective utilization of these technologies. The gap is caused by two factors:

- o An unprecedented increase in functionality and cost performance of the information technologies which is creating strategic opportunities for many companies.
- o The fact that most senior managers have little or no experience or background in managing information and telecommunications technologies. Thus they do not have an experiential base to relate this new form of strategic opportunity to their business.

It was only a few years ago that Alan Kantrow¹ wrote, "The past decade reveals managers' growing awareness of the need to incorporate technological issues within strategic decision making. They have increasingly discovered that technology and strategy are inseparable." Today's reality is that, while most managers have increasingly focused on the basic technologies underlying their respective industries as an ingredient of strategy, far too many have missed the significance of the new computer and communication technologies which today effect all industries.

In the past year, we have discussed this situation with top executives and technology managers in two dozen companies. In some, we

¹ Alan M. Kantrow, The Strategy/Technology Connection, Harvard Business Review, July/Aug. 1980, pp 6-21.

have performed in-depth studies of significant exploitation of the technology.

In order to provide senior management with some rough guidelines for applying the computer and communication technologies (which we jointly refer to as "information technology", or "IT") to their strategic needs, this paper will discuss:

- o The information technology "drivers" which are forcing new business strategies;
- o The current status of attention to these technologies in the development of organizational strategies;
- o Some ways in which leading edge companies are using information technology to improve their strategic position;
- o A simple, but useful, framework for exploring information technology strategic opportunities; and
- o A managerial approach, arising from our studies, which appears appropriate for effective application of the new technology.

THE DRIVING FORCES

There are two steady forces driving the information technology opportunity. They are:

- o The New Information Technology Economics - which are summed up by an unrelenting year-after-year 30% to 40% improvement in the cost performance of circuitry and mass storage, with steady smaller cost performance improvements in telecommunications. Several examples are illustrative of the dynamics of this cost performance progress:

Processors. Today's \$5000 personal computer is almost equivalent in capability to the million dollar computer of the 1960's.

Telecommunications. Long distance fiber optics circuits will be installed during the rest of the decade at one tenth the cost of the conventional circuits they will replace. This will provide a radical change in telecommunications cost/performance.

Software. Despite the publicity given to the hardware, this is the area of most dramatic change. Languages and applications that facilitate new uses and users of information technology are coming to market at an ever increasing rate. For example, not much more than a decade ago, it cost hundreds of hours and tens of thousands of dollars to program financial pro-forma capability. Today, a "spread sheet" program like "VISICALC" costs a few hundred dollars. Literally hundreds of thousands of copies have been sold to end users in the market place. And ever more powerful and more easily usable software is being produced at an increasing rate.

- o The New Business Environment - Today all businesses face the unrelenting pressures of a business environment characterized by intense global competition, as recently described by Levitt.² Moreover this increasingly competitive world has developed against a backdrop of difficult economic conditions including long term high inflation, high interest rates, and low real growth.

² Theodore Levitt, "The Globalization of Markets", Harvard Business Review, May/June 1983, pp. 92-102.

The interaction of these two variables - information technology and a challenging business environment - has generated what might be called the economic imperative of the information technologies. Organizations which do not take advantage of the growing opportunities provided by the electronic technology appear likely to slip behind in the competitive world.

One example clearly illustrates this imperative. The revitalization of the manufacturing industry in the United States leans strongly on a number of information technologies. For companies to compete effectively internationally, several of these technologies must be utilized. These include computer assisted design and manufacturing, automated factories and robotics, and new approaches to inventory flow, such as the Japanese "Kanban", which requires close interconnection between production facilities and key suppliers.

TODAY'S REALITY

Kantrow, in his previously cited article, argues persuasively that to exploit strategic opportunities arising from technology, a senior management entrepreneurial attitude is required which will:

- o view new technology as a central part of business thinking;
- o examine how the key decisions of the senior managers can be affected by the new technology;
- o be willing to examine cross-functional/organizational utilization of the technology; and
- o consider the planning and production processes required to exploit the technology.

Today, an increasing number of companies are adopting this attitude

with regard to the basic technologies relevant to their industries. However, we did not see significant evidence of this kind of thinking with respect to information technology in our discussions with companies, many in the multi-billion dollar class. In brief, the following was clear from these discussions:

- o In only a small handful of companies was there clearly evident managerial attention to the potential impact of information technology on corporate strategy. These few companies had clearly delineated formal processes to ensure Information Technology input to the development of strategy. In the remainder, IT input, where it existed, was informal at best.
- o In almost all cases, this input was a relatively new phenomenon, occurring for the first time in the past 12-18 months.
- o Even where IT input was available at the corporate level, managers to whom we talked believed that it was not being effectively included in the planning process at lower levels.

This last point is particularly relevant since, as noted later, our research indicates that strategically oriented information technology applications can be generated at all organizational levels. In fact, most of the effective applications we have seen have been developed spontaneously at lower levels within the organization. Although, in a few cases, they arise from a corporate executive's strategic business vision, this is not the primary source of the strategic application of the technology which we have seen.

THE UTILIZATION OF "IT"

Despite a more general lack of attention to the significance of information technologies, a number of companies have seized upon them for competitive advantage. Five significant examples of this are:

- o AMERICAN HOSPITAL SUPPLY (AHS), a leading manufacturer and distributor of a very broad line of products for doctors, laboratories, and hospitals, has since 1976 evolved an order entry/distribution system that directly links the majority of its customers to AHS computers. Over 4,000 customer terminals at various locations are today linked to the American Hospital Supply system. As well as providing the customer with direct access to the AHS order/distribution process, the system allows customers to perform functions, such as inventory control, for themselves thus generating incremental revenues for AHS. The American Hospital Supply system has been successful because it simplifies ordering processes for customers, reduces costs for both AHS and the customer, and allows AHS to develop and manage pricing incentives to the customer across all product lines. As a result, customer loyalty is high and AHS market share has been increasing.

AHS's initial move to electronic ordering was begun by the manager of a regional distribution center working to fill the needs of a single customer. A far-sighted senior management has continually supported the system "with management attention and development funds".

- o DIGITAL EQUIPMENT CORPORATION (DEC) has utilized the recently developed software technology for "expert systems" to significantly improve a system configuration problem. Due to the tremendous variety of possible configurations of its equipment, and the difficulty of ensuring that each system was appropriately configured, DEC was faced with a problem of rework of manufactured configurations at field installation time. In addition to the expense involved, the necessary rework caused lost revenue due to deferral of invoicing and customer complaints. In conjunction with Carnegie-Mellon University, DEC engineers captured the "expert rules" utilized by the most knowledgeable design and field service engineers in a computer

program. This ensures that expertly designed configurations will be developed for every system for manufacture and subsequent field installation. The system has proven extremely successful and is now being accessed, on a trial basis, by sales personnel in their order generating process. Thus customers in the field can be assured that their order is appropriate and fully specified at the time it is entered.

- o USA TODAY was largely the conception and creation of Allan H. Neuharth, president of GANNETT NEWSPAPERS, who devoted much of a year's time to studying the information generation and transmission technologies needed to create the first "national" newspaper and to transmit it by satellite to 17 geographically dispersed printing plants. The paper was introduced in September 1982 and by October 1983 was selling 1.1 million copies a day in 19 metropolitan areas. Satellites and other information technology allow a 36-page edition to be created, transmitted in 8 hours, and printed with full color quality.
- o In 1977, MERRILL LYNCH & CO. established the Cash Management Account (CMA) which has shattered the traditional boundaries between the banking and securities industries. The CMA is a combination of charge card, checking account, and brokerage service all rolled into one product. Implementation required a complex information technology interface of communications and data processing between the Merrill Lynch brokerage offices and Bank One which acts as the check and credit card processing center for the CMA accounts. By February 1983, more than 915,000 accounts were in place. Accounts were being added at a rate of 5,000 a week. Other financial institutions such as Shearson-American Express have introduced competitive offerings and are fighting vigorously to gain a share of this newly created market made possible by IT.

The Cash Management Account's origins were in a 1975 study by Stanford Research Institute for the then Chairman Donald Regan. The planning organization at Merrill Lynch developed the initial vision into today's highly successful CMA system.

- o XEROX, in the years 1979-1982, implemented a Field Work Support System to provide better and more cost effective service to its very large worldwide customer base of office equipment. The system is operational on over 50 distributed minicomputers in the U.S., Canada, and Europe to facilitate the way thousands of Xerox customer service representatives support their customers.

The customer calls a work support representative who has computerized access to information about the customer, previous call history, and the workloads of technical representatives in the area. Upon the completion of each call, the work support representative schedules the customer service representative to the next customer site. The customer service representative is also provided with information about the problem he will encounter and parts probably needed. Additionally, a substantial number of calls are diagnosed on the telephone, reducing the total number of calls made.

The Field Work Support System is strategically important to Xerox because it improves customer satisfaction through faster, high quality, response time and improves productivity of the large tech rep force by increasing the number of calls each can make.

From the previous examples it is clear that some companies are implementing systems of strategic importance. Some senior managements are acutely aware of the strategic potential of information technology.

And, in some cases, senior management is leading the charge. In others, it has merely created a climate which supports IT innovation.

OPPORTUNITIES

Senior Executives need a simple method to help determine where strategic opportunities for use of information technology exist. Several have been developed. Each provides a framework for exploring potential opportunities.

Michael Porter's framework³ for developing strategy in a competitive environment is a starting point for some useful frameworks. Porter suggests that, for any company, significant strategic actions consist either of diminishing supplier or customer power, holding off new entrants into their industry, lowering the possibility of substitution for their products, or gaining a competitive edge within the existing industry. Authors using this framework in discussing IT and strategy, provide checklists or ways in which to make any of the strategic moves through the use of IT.^{4,5} Suggestions for companies following each of Porter's three "generic strategies" (low cost, differentiation and niche) are also made.

Alternatively, a thorough search of the "value-added" chain for the most useful application of IT is suggested by some.⁶ Here, the

³ Porter, Michael E., Competitive Strategy, The Free Press-Macmillan Publishing Corporation, N.Y. 1980.

⁴ Parsons, Gregory L., "Information Technology: A New Competitive Weapon, Sloan Management Review, Fall 1983, Vol. 25 No. 1, pp3-14.

⁵ McFarlan, F. Warren, "Linking I-S Strategy - Corporate Strategy" Harvard Business School, Research Paper 75th Anniversary Colloquium Series, July 10-13, 1983.

⁶ Scott Morton, Michael S., "Implications of Changes in Information Technology for Corporate Strategy", CISR WP #98, Sloan WP #1408-83, M.I.T.

manager carefully analyzes all steps in the business process from R&D and purchasing through final sales to ascertain the critical points at which IT can be best applied.

Other approaches abound.⁷ We believe, however, that, in light of today's technology each senior manager should focus on two significant questions. These are:

Can I use the technology to make a significant change in the way we are now doing business so my company can gain a competitive advantage?

Should we, as a company, concentrate on using IT to improve our approach to the marketplace? Or, should we center our efforts around internal improvements in the way we currently carry out the activities of the firm?

These are the basic questions. There exist, today, significant opportunities in some industries to utilize IT to deliver revolutionary new products - in effect changing the industry - or to vastly redefine current approaches to manufacturing, purchasing, etc. This huge competitive "leap" should be a foremost concern of senior management. If not undertaken by one's own company, it is open to exploitation by others. Alternatively, if no such opportunity appears feasible, attention should turn to improving the current business through IT.

There are, moreover, two ways in which any business can be

⁷ See, for example Gerstein, Marc and Reisman, Heather "Creating Competitive Advantage With Computer Technology," The Journal of Business Strategy, Summer 1982, Vol. 3, No. 1, pp. 53-60 or Lucas, Henry C. Jr., "A Corporate Strategy for the Control of Information Processing," Sloan Management Review Spring 1982, Vol. 23, No. 3 pp. 25-36.

substantially made better. Our second question is meant to place emphasis on both. Most attention today is being given to using the technology to improve the organization's impact in the marketplace. Most of the companies that we have seen, however, have significant opportunities to improve key internal operations thereby lowering costs or improving service. Today's technology provides a myriad of ways to improve internal operations (e.g. CAD/CAM for faster, better integrated manufacturing processes - electronic or voice mail for improved communications). The list is long.

Taken together, our two questions suggest a four cell matrix as shown in Exhibit 1. We believe it presents a simple, but powerful way of thinking about strategic use of the technology. Our five examples each occupy cells of this matrix as noted below:

- o Significant Structural Change: Competitive Marketplace. Porter states that "The power of technology as a competitive variable lies in its ability to alter competition through changing industry structure."⁸ Gannett's creation of U.S.A. Today is a significant structural change in the production and distribution of newspapers leading to the creation of the Focus Metromedia Newspapers. If it is a long term success, it will cause a significant restructuring of the publication industry.
- o Significant Structural Change: Competitive Market Place. The Merrill Lynch Cash Management Account has directly changed the types of financial services offered to the consumer and has resulted in significant structural change in the financial services industry.
- o Significant Structural Change: Internal Operations. The Digital Equipment Corporation "Expert" system cited earlier is an

⁸ See Porter op. cit., p. 2.

example of applying new advanced software technology to an internal set of manufacturing processes. The result is computer-based configuration of computers, not a relatively frail manpower-intensive process.

- o Traditional Products and Processes: Competitive Marketplace. The American Hospital Supply order entry system is a strategic application of information technology that takes traditional internal products and processes (American's own order entry & distribution system) and links them directly to customers creating a potentially defensible barrier to competition.
- o Traditional Products and Processes: Internal Operations. Xerox has taken a traditional process - the dispatching of field service personnel - and, through an effective communication-computer system, has significantly increased both technical representative productivity and customer satisfaction.

In most companies there are strategic opportunities in all quadrants of the opportunities matrix. We give several other examples to make the application of the "opportunities matrix" more concrete:

- o UNITED AIRLINES began using teleconferencing services over 10 years ago for emergency situations and daily executive briefings, both of which are critical to the success of the airline's operation. Ongoing very favorable experience with teleconferencing has led UAL to stretch its application into matters as delicate as labor negotiations. Success has been reported in at least one key teleconferencing negotiation which resulted in significant time savings. In the context of the opportunities matrix, this is a refinement of a current internal process through use of information technology.
- o A recently hired junior employee of a BANK OF AMERICA line

division became interested in developing cash management analysis tools on a personal computer. Once a rough prototype was working, it was demonstrated to the division's senior management, and funds were allocated to develop a full fledged prototype of a working system. The prototype system was tested by four major customers of the Bank of America. The results of the experiment disclosed a sizeable opportunity to enhance the bank's relationship with corporate treasurers. Several very useful functions could be provided on the personal computer. These included facilities for analysis of corporate balances; a direct linkage into the Bank of America funds transfer system; and, via Bank of America, linkage to the other major money center banks. In this instance the strategic opportunity is focused on the competitive marketplace and is a significant

refinement of a traditional process of providing information to customers.

- o TOYOTA U.S. has established an extensive system to support its widespread dealers network. The system, as well as providing Toyota with timely order and inventory control data, also provides the dealers with an on-site system to run their own business. The system is composed of the Toyota data center linked by Toyota's telecommunications network, to dealers who have minicomputers of different capacities and functionality geared to their own business needs. Toyota benefits through more accurate sales and inventory data. The dealers are able to manage their own businesses better and are linked more tightly to Toyota in their business relationship. The Toyota system is externally focused and combines a traditional process (order/inventory) with a new powerful addition; a system to support the dealer in managing his own business.

- o Three years ago (1980) GENERAL ELECTRIC found that consumers did not feel that GE was adequately responsive to their inquiries of any type. Consumers wanted more product information before purchase and additional information after owning the product. The GE Answer Center, utilizing an "800" line for toll-free calling, was opened as part of an overall strategy in the Consumer Products Sector to better meet customer needs. The system which now covers all GE products and handles over one and a half million calls per year. Computers are used to retrieve 500,000 pieces of information about GE's 8,500 products. Some 94% of the customers who use the system express satisfaction with the results. In this instance GE has restructured the way they deal with their end point customer, the consumer.

SUMMARY - WHAT NEEDS TO BE DONE

Multiple opportunities for strategic use of information technology exist today. More are constantly emerging with the increasing flow of lower cost technologies providing significant new capabilities. And they are increasingly being seized upon as competitive pressures grow. What steps, then, should senior management take to move the strategic application of information technology forward within the organization. We suggest three straightforward actions:

(1) Ask the two questions on page 11, with the first one having precedence. There are, today, significant opportunities for competitive advantage through IT.

(2) Focus attention on information technology at the top of the corporation. In most of the cases where significant structural change has been effected, it has been as the result of a senior person's vision. (e.g., USA Today, Merrill Lynch). The business understanding for this vision, and the ability to implement it, are rarely found in the lower parts of the organization.

(3) Generate awareness of the potential advantages of IT, and incentives to take advantage of it, throughout the organization. Our research indicates that most of the strategic improvements in current processes have bubbled up through the organization. This is consistent with von Hippel's⁹ research on innovation, in which he concludes that the majority of technological innovation emerges not from the supplier's research and development but from creative uses of existing technology by organization's customers. It is necessary, therefore, to maintain alertness to possible new uses of the technology at all levels of the organization - especially among those personnel with customer contact. As Joseph L. Dionne,¹⁰ CEO of McGraw-Hill, Inc. notes, "customers are the key to creating the new generations of electronic products and services. . . . Every time the customer asks for a new application of the technology, McGraw-Hill responds by creating a new product that can then be marketed elsewhere."

In short, senior management should work to create an environment in which information technology is considered an important strategic weapon. The appointment of a senior "Technology Officer" reporting at a high level in the corporation is one possible way to effect this. The exact actions taken, however, will be different from organization to organization and with each businesses' strategy, structure and culture.

Perhaps one of the most comprehensive approaches toward underscoring the importance of IT for all levels of the organization has been taken by Emhart, a major factor in shoe machinery hardware and related industries.

⁹ Von Hippel, Eric A. "Users as Innovators," Technology Review Vol. 80, No. 3, January 1978, Massachusetts Institute of Technology, Cambridge, Mass.

¹⁰ Dionne, Joseph L. "Confronting the Communications Revolution," The Journal of Business Strategy Vol. 4, No. 1, pp. 74-77, Summer 1983.

After considerable research into strategic options the CEO and President concluded that the company would have to invest heavily and creatively in all types of technology - with emphasis on information technology.

To signal this corporate emphasis to the organization, two new roles were created - a Director of Technology, and a Director of Information Technology. More significantly, a new sub-committee of the Board of Directors was formed - a sub-committee of Technology which receives reports from the two directors at its periodic meetings. These moves have served to indicate clearly and successfully to the organization the motive of the technological thrust underlying Emhart's ambitious new goals.

It is clear that all companies will not choose this same organizational approach. Yet those organizations which choose to conduct business as usual in the midst of a major information technology revolution will, we believe, be overlooking a very major opportunity.

OPPORTUNITIES MATRIX

COMPETITIVE MARKETPLACE INTERNAL OPERATIONS

<p>SIGNIFICANT STRUCTURAL CHANGE</p>	<p>GANNETT - <u>USA TODAY</u> MERRILL LYNCH GENERAL ELECTRIC</p>	<p>DIGITAL EQUIPMENT</p>
<p>TRADITIONAL PRODUCTS & PROCESSES</p>	<p>AMERICAN HOSPITAL SUPPLY BANK OF AMERICA TOYOTA</p>	<p>XEROX UNITED AIRLINES</p>

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